IN THE SPECIFICATION

1. Please amend two paragraphs on page 1, from line 12 thru 16, as follows:

A general AC microwave oven is adapted to drive a magnetron thereof for generating a microwave through [[an]] application of commercial AC voltages of 110-230V.

In the meantime, [[A]] a DC microwave oven has been developed which may be used in regions outside a town, or in transportation of various kinds such as vehicles, ships, airplanes, and the like, to which the commercial AC voltages are hardly supplied.

2. Please amend the paragraphs bridging pages 1 thru 2, from line 20 on page 1 thru line 12 on page 2, as follows:

The DC microwave oven employing a general DC battery of 12V or 24V requires large currents of 30A-100A in order to drive the magnetron thereof. Accordingly, switches, that is, a primary interlock switch operated in association with the ~~openings~~ opening and ~~closings~~ closing of the door of the microwave oven, and a secondary interlock switch operated in response to the manipulations of a cooking on/off button, which directly controls the voltage supply to the DC microwave oven, are required to fully accept the large currents from the DC power supply of the DC battery.

However, there exists a problem in that the switches for the large current [[is]] are

hardly manufactured ~~as well as requires a high~~ and the required manufacturing cost is high.

Further, the DC microwave oven ~~satisfies~~ must satisfy interlock regulations required by standard institutes for microwave ovens. That is, the DC microwave oven should be in a structure such that it does not drive the magnetron thereof in a short-circuit state of the primary interlock switch and the secondary interlock switch.

In addition to the above, the microwave oven is required to have a structure [[of]] for protecting circuit components through the suppression of excessive current inflow from a DC power source.

3. Please amend the last two paragraphs on page 2, from line 15 thru line 22, as follows:

The present invention is devised to solve the above problem and meet the above requirements, and an object of the present invention is to provide a driving circuit of a DC microwave oven, and a method of controlling the same, capable of protecting circuit components against excessive currents inflowing from a DC power supply.

Another object of the present invention is to provide a driving circuit of a DC microwave oven, and a method of controlling the same, capable of switching on and off a DC power supply through switches of a small capacity, while [[and]] satisfying the interlock regulations of microwave ovens.

4. Please amend the third paragraph on page 3, from line 16 thru line 17, as follows:

It is preferable that the excessive current detecting part ~~includes~~ include plural bipolar transistors driven in the same periods as the inverting unit with an input of the driving pulses.

5. Please amend the last paragraph on page 4, from line 19 thru line 21, as follows:

It is preferable that a switch monitor switch [[is]] be further provided for cutting off the supply of the DC voltage to the high voltage transformer when the cooking chamber door is in the open state.

6. Please amend the paragraph bridging pages 5 and 6, from line 14 on page 5 thru line 3 on page 6, as follows:

Further, in order to achieve the above object, a driving method of a DC microwave oven is provided according to the present invention, ~~in a driving method of a~~ the DC

microwave oven having an inverting unit for converting a DC voltage of a DC power supply into an AC voltage by driving pulses, a high voltage transformer for transforming the AC voltage applied by the driving of the inverting unit and supplying the transformed AC voltage to a magnetron, a pulse driving unit for generating the driving pulses, and a switching unit for switching on and off the voltage supply to the pulse driving unit from the DC power voltage, and the method comprises steps of a) driving the pulse driving unit by controlling the switching unit if a cooking chamber door is closed and a cooking start selection signal is inputted; b) detecting whether an excessive current is supplied to the high voltage transformer through the inverting unit driven by the pulse driving unit; and c) cutting off the voltage supply to the magnetron by stopping the driving of the pulse driving unit if the excessive current is detected.

7. Please amend the five consecutive paragraphs on page 6, from line 6 thru line 20, as follows:

The above objects and the other advantages of the present invention will become more apparent by describing in detail [[a]] preferred embodiments thereof with reference to the attached drawings, in which:

FIG. 1 is a view [[for]] showing a driving circuit of a DC microwave oven according to a first embodiment of the present invention;

FIG. 2 is a view [[for]] showing a driving circuit of a DC microwave oven

~~according to a second embodiment of a DC microwave oven~~ according to a second embodiment of the present invention; and

FIG. 3 is a view [[for]] showing a driving circuit of a DC microwave oven ~~according to a third embodiment of a DC microwave oven~~ according to a third embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 is a view [[for]] showing a driving circuit of a DC microwave oven according to a first embodiment of the present invention.

8. Please amend the last two paragraph on page 7, from line 15 thru line 22, as follows:

The pulse driving unit [[VFC]] VFC1 of a pulse driving means generates first and second driving pulses, through first and second pulse output terminals OUT1 and OUT2, respectively, which alternately inverts the pulse periods.

The pulse driving unit [[VFC]] VFC1 is supplied with a predetermined DC voltage, for example, 15V, through a voltage terminal Vcc connected through the DC power supply DC. Accordingly, the first and second field effect transistors FET1 and FET2 ~~receives~~ receive the first and second driving pulses generated from the output ~~terminal~~ terminals OUT1 and OUT2 through [[the]] their respective [[gage]] base

terminals, respectively, to be alternately turned on and off.

9. Please amend the first two paragraphs on page 8, from line 1 thru line 10, as follows:

An AC voltage is applied to the primary coil T1 of the high voltage transformer HVT according to the alternate driving of the first and second field effect transistors FET1 and FET2. Accordingly, [[A]] a high AC voltage in proportion to a winging ratio is induced in the secondary coil T2 of the high voltage transformer HVT, and an AC voltage, increased by a high voltage capacitor HVC and a high voltage diode HVD which are connected to the secondary coil T2, is applied to the magnetron MGT. Therefore, the magnetron MGT generates a microwave based on the supplied power.

In the meantime, [[a]] the driving circuit is equipped with a switching unit mounted to switch on and off the power supply to the pulse driving unit VFC1 according to the openings and closings of a cook chamber ~~door(not shown)~~ door (not shown).

10. Please amend the two consecutive paragraphs on page 8, from line 13 thru line 19, as follows:

The door sensing switch DSW is mounted to directly or indirectly switch on and off the voltage supply passageways to a voltage input terminal of the pulse driving unit

based on the interference of the cooking chamber [[room]] according to the opening and closing states of the cooking chamber door. The door sensing switch DSW is mounted in order [[for]] that general micro switches [[to]] intervene in the opening and closing of the cooking chamber door.

An exciting coil ICO is connected to [[the]] a ground terminal through a switching transistor 41 under the switching ~~controls~~ control of a microcomputer 40.

11. Please amend the first paragraph on page 9, from line 3 thru line 8, as follows:

The voltage regulator 30 regulates voltages from a DC voltage of 12V of the DC power supply DC to a DC voltage of 15V necessary for the ~~operations~~ operation of the pulse driving unit VFC1, and then supplies the regulated voltage to the voltage input terminal of the pulse driving unit VFC1 through the primary interlock switch PSW and the secondary interlock switch SSW. ~~In case that~~ If a voltage required in the pulse driving unit VFC and an output voltage of the DC power supply DC are the same, the voltage regulator 30 may be omitted.

12. Please amend the penultimate paragraph on page 9, from line 13 thru line 19, as follows:

The secondary interlock switch SSW is connected in ~~parallel~~ series with the primary interlock switch PSW on the voltage supply passageway to the voltage input terminal of the pulse driving unit VFC1, and is mounted to control the switching-on and the switching-off according to the states of the door sensing switch DSW. That is, if [[a]] switching transistor 41 is turned on by the control of the microcomputer 40 which controls the execution of the cooking functions in [[the]] a state [[that]] wherein the door sensing switch DSW is switched on, the secondary interlock switch SSW is switched on by the conduction of current in the exciting coil ICO.

13. Please amend the two paragraphs on page 10, from line 7 thru line 22, as follows:

The first and second monitor switches MSW1 and MSW2 are mounted so as to be associated with the cooking chamber door, and so as to ~~thereby~~ be switched on when the cooking chamber door is opened and switched off when the cooking chamber door is closed. Accordingly, when the door is opened, a voltage supply to the high voltage transformer HVT is suppressed by the first and second monitor switches MSW1 and MSW2, even ~~though~~ if the switches DSW and PSW are turned on [[with]] due to malfunctions of the switching unit.

In the meantime, a fuse FUSE1 for protecting components when a large current flows in the state that the first and second monitor switches MSW1 and MSW2 are turned on is mounted in the voltage supply passageway having the monitor switches MSW1 and

MSW2 and the DC power supply DC. That is, [[one]] first ends of the monitor switches MSW1 and MSW2 are connected to the DC power supply DC through the fuse FUSE1, and ~~the other~~ second ends thereof are connected between corresponding field effect transistors FET1 and FET2 and the primary coil T1 of the high voltage transformer HVT. Accordingly, the fuse FUSE1 is opened by a large current flowing when a closed circuit is formed as the first and second monitor switches MSW1 and MSW2 are switched on, [[to]] thereby ~~prevent~~ preventing the driving of the magnetron MGT.

14. Please amend the first paragraph on page 11, from line 1 thru line 5, as follows:

The microcomputer 40 is in charge of overall ~~controls~~ control with respect to diverse cooking functions which are provided. The microcomputer 40 switches on the secondary interlock switch SSW by driving the switching transistor 41 if an input signal for executing a certain cooking function is inputted through [[a]] an operation panel by a user in the state [[that]] where the door is closed.

15. Please amend the paragraphs bridging pages 11 and 12, from line 9 on page 11 thru line 3 on page 12, as follows:

A first relay switch RY1 is switched on when the door sensing switch DSW is

switched off according to the open state of the door. Accordingly, a door lamp L is lit with the supply of the DC voltage from the DC power supply DC if the first relay switch RY1 is turned on.

A second relay switch RY2 is switched on in association with an input of a cooking start selection signal from the operation panel by a user in the state [[that]] where the door sensing switch DSW is turned on. Accordingly, a fan motor F for cooling the magnetron MGT is rotated by the DC power voltage in the state [[that]] where the second relay switch RY2 is turned on.

The first and second relay switches RY1 and RY2 [[is]] are preferably controlled by the microcomputer 40.

Hereinafter, the ~~operations~~ operation of the driving circuit of a microwave oven is described in detail.

First of all, [[in]] when the cooking chamber door is opened, the door sensing switch DSW and the primary interlock switch PSW are turned off. Therefore, [[a]] voltage supply [[of]] to the pulse driving unit VFC1 from the voltage regulator 30 is cut off, and the first and second field effect transistors FET1 and FET2 are turned off, so that the voltage supply to the magnetron MGT is not achieved.

16. Please amend the paragraphs bridging pages 12 and 13, from line 7 on page 12 thru line 7 on page 13, as follows:

If a cooking start selection button is pressed from the operation panel ~~according to the~~ as a result of manipulation [[of]] by a user in the state [[that]] wherein the door is closed, the microcomputer 40 turns the switching transistor 41 on. Therefore, the secondary interlock switch SSW is turned on by an electromagnetic force generated by the conduction of current [[of]] through the exciting coil ICO.

If the primary interlock switch PSW and the secondary interlock switch SSW are [[all]] both turned on, the pulse driving unit VFCI is operated by a voltage supplied from the voltage regulator 30, and generates first and second pulse ~~signal~~ signals with alternate pulse-generating periods through first and second pulse output terminals OUT1 and OUT2.

In the meantime, the first and second field effect transistors FET1 and FET2 are alternately turned on and off by the first and second pulse signals generated [[from]] by the pulse driving unit VFC1. According to the alternate turning on and off of the first and second field effect transistors FET1 and FET2, an AC voltage is applied to the primary coil T1 of the high voltage transformer HVT, and a high voltage is induced in the secondary coil T2.

Accordingly, the magnetron MGT is driven by the voltage induced in the secondary coil of the high voltage transformer HVT and increased by the high voltage capacitor HVC and the high voltage diode HVD so as to generate a microwave.

In the meantime, ~~in case that~~ if a short-circuited state is maintained even though the cooking chamber door is opened ~~with an~~ due to malfunction of the primary interlock

switch PSW and the secondary interlock switch SSW, the fuse FUSE1 is opened by the first and second monitor switches MSW1 and MSW2, which are turned on according to the opening of the cooking chamber door. If the fuse FUSE1 is opened, a voltage supply [[of]] to the high voltage transformer HVT from the DC power supply DC is cut off, so that the driving of the magnetron MGT is stopped.

17. Please amend the third paragraph on page 13, from line 10 thru line 11, as follows:

The components having the same functions as those in the previous drawing will be indicated [[as]] by the same reference numerals, and will not be described in detail.

18. Please amend the paragraph on line 15 of page 13 as follows:

~~A reference~~ Reference numeral 54 indicates a comparator built [[in]] into the pulse driving unit VFC2.

19. Please amend the paragraph bridging pages 13 and 14, from line 20 on page 13 thru line 3 on page 14, as follows:

The base electrodes of the first and second transistors 50 and 51 [[as]] form the excessive current detecting part and are connected to the first and second pulse output

terminals OUT1 and OUT2, respectively, of the pulse driving circuit VFC2 ~~respectively~~. Further, the collector electrodes of the first and second transistors 50 and 51 are connected to the positive terminal of the DC power supply DC through the primary coil T1 of the high voltage transformer HVT, and the emitter electrodes thereof are connected to [[the]] ground through resistors R7 and R8, respectively,

20. Please amend the three consecutive paragraphs on page 14, from line 9 thru lin 19, as follows:

In the meantime, the current flowing through the first and second transistors 50 and 51 corresponds in amount to a current flowing in the primary coil T1 of the high voltage transformer HVT ~~in amount~~. Accordingly, if [[the]] there is an amount of current alternately flowing in the primary coil T1 of the high voltage transformer HVT, a voltage level dropped by resistors connected with the first and second transistors 50 and 51 ~~is raisen~~ increases.

A common connection is performed between the emitter of the first transistor 50 and the resistor R7 and between the emitter of the second transistor 51 and the resistor R8, and [[then]] the common connection is connected to the non-inverting input terminal of the operational amplifier 52.

The inverting terminal of the operational amplifier 52, which is an element of an amplification unit [[of]] for amplifying a current detecting signal, is grounded through a

resistor R9, and ~~also grounded to~~ the output terminal thereof is also grounded through another resistor R10.

21. Please amend the first three paragraphs on page 15, from line 3 thru line 15, as follows:

The non-inverting input terminal of a comparator 54 employed for the comparison part is connected to the output terminal of the operational amplifier 52, and the inverting terminal thereof is connected between voltage-dividing resistors R12 and R13 ~~for generating~~ which generate a reference voltage by dividing a voltage of 5V.

FIG 2 shows that an operational amplifier 54 in the pulse driving unit VFC2 is used as the comparator 54 when a commercial integrated circuit, having a redundant operational amplifier in addition to a pulse generator, is used as the pulse driving unit VFC2. The pulse driving unit VFC2 is adapted to be supplied with a voltage through the door sensing switch DSW from the DC power supply DC, for example, 12V.

In the meantime, if an excessive current detecting signal is generated by the excessive current detecting unit, an excessive current maintaining unit is further included, preferably, to ~~applies~~ apply the excessive current detecting signal while continuously maintaining the excessive current detecting signal.

22. Please amend the last paragraph on page 15, from line 19 thru line 22, as

follows:

The base electrode of the third transistor 53 is connected to a feedback terminal FB of the pulse driving unit VFC2. The emitter electrode of the third transistor 53 is connected to ~~the earth~~ ground through the resistor R14, and is connected to the non-inverting terminal of the comparator 54 through the diode D1.

23. Please amend the paragraphs on page 16, from line 1 thru line 18, as follows:

Here, if the pulse driving unit VFC2 generates a comparison result signal corresponding to a ~~result that~~ condition wherein a voltage exceeding the reference voltage from the comparator 54 is detected, the outputs of the first and second pulse signals from the first and second pulse output terminals OUT1 and OUT2 are stopped. At the same time, the pulse driving unit VFC2 continuously generates a feedback control signal which turns the third transistor 53 on through the feedback terminal FB.

Therefore, the third transistor 53 maintains ~~the turning-on~~ a turned-on state by inputting through the base electrode thereof the feedback control signal continuously outputted from the pulse driving unit VFC2, and the feedback signal outputted through the diode D1 is inputted to the comparator 54 as a voltage exceeding the reference voltage induced in the inverting terminal of the comparator 54.

Hereinafter, the ~~operations~~ operation of the driving circuit of a microwave oven according to the second embodiment of the present invention will be described in detail.

First of all, if the door sensing switch DSW is switched on, the pulse driving unit VFC2 is driven with an input of a DC voltage of 12V through the voltage terminal Vcc. The driven pulse driving unit VFC2 generates the first and second pulse signals having [[the]] alternate pulse periods relative to each other through the first and second pulse output terminals OUT1 and OUT2, respectively.

24. Please amend the paragraphs on page 17, from line 6 thru line 13, as follows:

The operational amplifier 52 ~~inputs~~ receives an input formed in the emitter electrodes of the first and second transistors 50 and 51, respectively, through the non-inverting terminal, amplifies the input, and outputs a resultant voltage ~~formed in the emitter electrode of the first and second transistors 50 and 51~~, and the comparator 54 built [[in]] into the pulse driving unit VFC2 compares [[a]] the voltage signal outputted from the operational amplifier 52 with the reference voltage produced by the voltage-dividing resistors R12 and R13, and generates a comparison result signal.

During the ~~operations~~ operation, if an excessive current is applied to the high voltage transformer HVT, the voltages of the emitter electrodes of the first and second transistors 50 and 51 are increased, so that the comparator 54 outputs a signal of a high

level.

25. Please amend the first paragraph on page 18, from line 1 thru line 4, as follows:

As a result, the first and second field effect transistors FET1 and FET2 ~~maintains~~ maintain the turn-off states thereof, so that the driving of the magnetron is stopped. Accordingly, related circuit components including the first and second field effect transistors FET1 and FET2 are protected from an excessive current.

26. Please amend the third and the fourth paragraphs on page 18, from line 7 thru line 12, as follows:

The components having the same functions as those in the previous drawing will be indicated [[as]] by the same reference numerals, and will not be described in detail.

Referring to FIG. 3, the driving circuit has first and second monitor switches MSW11 and MSW22, first and second transistors 50 and 51, an operational amplifier 52, a third transistor 53, a diode D1, a pulse driving unit VFC2, and a comparator 54 built [[in]] into the pulse driving unit VFC2.

27. Please amend the paragraphs bridging pages 18 and 19, from line 20 on

page 18 thru line 15 on page 19, as follows:

The first and second monitor switches MSW11 and MSW22, each having three terminals, selects either of a first loop passing from the DC power supply DC to the fuse FUSE1, or [[of]] a second loop passing the excessive current detecting/maintaining unit by switching operations. That is, the fixed terminals of the first and second monitor switches MSW11 and MSW22 are connected on a current supply path connecting the first and second field effect transistors FET1 and FET2 of an inverter unit and the high voltage transformer HVT, the first contact N11 selectively switched with the fixed terminal is connected to the DC power supply through the fuse FUSE1, and the second contact N12 selectively switched with the fixed terminal is connected to a unit for carrying out the detection of an excessive current when the cooking chamber door is closed.

The first and second monitor switches MSW11 and MSW22 are operated with the cooking chamber door, ~~to thereby~~ so as to be connected to the first switching contacts N11 and N21 if the cooking chamber door is opened, and to be connected to the second switching contacts N12 and N22 if the cooking chamber door is closed.

In the meantime, if the primary interlock switch PSW and the secondary interlock switch SSW are short-circuited [[by]] due to a malfunction when the cooking chamber door is opened, the fuse FUSE1 is opened by the first and second monitor switches MSW11 and MSW22, being connected to the first switching contacts N11 and N21.

28. Please amend the last paragraph on page 19, from line 18 thru line 21, as follows:

The collector electrodes of the first and second transistors 50 and 51 are connected to the second switching contacts N12 and N22 of the first and second monitor switches MSW11 and MSW22, and the emitter electrodes thereof are connected to ~~the earth~~ ground through the resistors R7 and R8.

29. Please amend the paragraphs bridging pages 20 and 21, from line 1 on page 20 thru line 3 on page 21, as follows:

Hereinafter, the ~~operations~~ operation of the driving circuit of a microwave oven according to the third embodiment will be described in detail.

First of all, if the primary interlock switch PSW and the secondary interlock switch SSW are turned on to receive a DC voltage of 15V outputted from the voltage regulator 30 through the voltage terminal Vcc, the pulse driving unit VFC2 generates the first and second pulse signals with alternating [[the]] pulse generating periods through the first and second pulse output terminals OUT1 and OUT2 thereof. Therefore, as stated above, an AC voltage is applied to the high voltage transformer HVT, [[to]] thereby [[drive]] driving the magnetron MGT. At this time, the switch terminals of the first and second monitor switches MSW11 and MSW22 are connected to the second switching

contacts N12 and N22.

In the meantime, during the driving ~~operations~~ operation, if an excessive current is generated in a closed circuit formed by the alternate switching-on operations of the first and second field effect transistors FET1 and FET2, a current flowing through the first and second transistors 50 and 51 is increased as stated above. As a result, the comparator 54 outputs a comparison result signal of a high level corresponding to the excessive current detection.

Therefore, the pulse driving unit VFC2 continuously generates a feedback control signal through the feedback terminal FB to maintain the detection state of an excessive voltage, and the first and second field effect transistors FET1 and FET2 [[is]] are controlled to be switched off, so that the driving of the magnetron is stopped.

In the meantime, if the primary interlock switch PSW and the secondary interlock switch SSW are abnormally short-circuited when the cooking chamber door is opened, a current flowing through the first and second field effect transistors FET1 and FET2, as a result of [[by]] the switching terminals of the first and second monitor switches MSW11 and MSW22 being switched to the first switching contacts N11 and N21, is bypassed. At this time, the fuse FUSE1 is opened by a large current.

30. Please amend the two consecutive paragraphs on page 21, from line 6 thru line 16, as follows:

As stated above, the driving circuit of a DC microwave oven according to the present invention is devised to control the driving of the push-pull circuit [[of]] for converting a DC voltage into an AC voltage by a pulse signal outputted from the pulse driving unit, and has low-current interlock switches in power supply paths connecting the DC power supply and the pulse driving unit, so that the switching-on and switching-off controls of the DC power supply in association with the cooking chamber door are facilitated.

Further, the driving circuit of a DC microwave oven according to the present invention has ~~advantages~~ the advantage of being capable of stopping the driving of the magnetron as [[the]] malfunctions of the interlock switches ~~occurs~~ occur or as an excessive current is generated from the DC power supply due to the occurrence of abnormal states, and the further advantage of preventing ~~damages~~ damage to circuit components due to the excessive current.